

Title: PHYSICAL PROPERTIES OF ASTEROIDS

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A. STRATEGY:

Infrared photometry at 1.2, 1.6 and 2.2 μm provides a relatively rapid and accurate method for the classification of asteroids and is important for comparison with laboratory measurements of meteorites and other possible compositional analogues. Extension beyond the visual is especially useful for minerals which have strong characteristic infrared colors such as olivine in the A class asteroids. Radiometry at long infrared wavelengths is important for deriving basic physical parameters (via thermal models) such as size and albedo which in turn enables the conversion of relative colors to absolute reflectances. In particular, albedos are the only way to distinguish among the otherwise ambiguous E, M and P classes of asteroids.

B. ACCOMPLISHMENTS:

We obtained JHK and/or N infrared observations of 15 asteroids at the NASA Infrared Telescope Facility (IRTF) on Mauna Kea in 1987. We have completed the analysis of 22 Aten, Apollo and Amor asteroids. Our results include albedos and diameters for these objects as well as the identification of the first known class M and class E near-Earth asteroids. The "standard" thermal model appears to be inadequate for some of these small asteroids because of their coarse regolith so we have therefore constructed a rotating thermal model for such asteroids. We have identified a subtle systematic difference between the sub-populations of large and small IRAS asteroids as well as several anomalous objects. We also participated in an IRTF sub-micron photometer (SUMP) engineering run.

C. ANTICIPATED ACCOMPLISHMENTS:

We are now reducing JHK photometry from our survey of the main belt. We will initiate a mini-survey of the Eos family and follow-up selected unusual IRAS asteroids. From this work, we expect to examine whether Eos asteroids are related to the parent bodies of ordinary chondritic meteorites. We will exploit the new SUMP facility by developing the capability to derive accurate visual/infrared colors. SUMP will allow us to eliminate uncertainties due to large lightcurve variations of the irregular near-Earth asteroids. This sub-micron system will also permit us to refine our thermal models in order to investigate the metallic phase in the regolith of some asteroids.

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D. PUBLICATIONS

Tedesco, E. F. and Gradie, J. (1987), Discovery of M-class objects among the near-Earth asteroid population. *Astron. J.*, **93**, 738.

Veeder, G. J., M. S. Hanner and D. J. Tholen (1987), The nucleus of Comet P/Arend Rigaux. *Astron. J.*, **94**, 169.

Veeder, G. J., D. L. Matson, E. F. Tedesco, L. A. Lebofsky and J. C. Gradie (1987), Radiometry of Deimos. *Astron. J.*, **94**, 1361.

Veeder, G. J., M. S. Hanner, D. L. Matson, E. F. Tedesco, L. A. Lebofsky and A. T. Tokunaga, Radiometry of near-Earth asteroids. Submitted to *Astron. J.*